

WHEN THOSE WHO CAN TEACH DON'T: THE ROLE OF STRIKES IN INCREASING
TEACHER LABOR SUPPLY

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Abstract

Across the United States, the number of college students completing teacher education programs as a share of total graduates has declined at both the state and national levels over the past fifteen years, falling from 255,106 (18% of four-year college graduates) in 2005 by nearly half to 159,937 (8%) in 2018. This dramatic decrease has exacerbated the shortage of qualified teachers in American schools and prompted a variety of reforms aimed at attracting new teachers. This paper examines the impact of one potential contextual factor that could encourage college students to pursue a teaching career: the increased attention drawn to teacher salary raises brought on by large-scale education strikes (taking place in disproportionately large districts or involving multiple districts across the state). By using data from the Department of Education's Title II Reports to compare strike and non-strike states, I find that large-scale teacher strikes have a modest, positive relationship to the share of college graduates earning teacher education degrees three-to-six years later.

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Introduction

Teaching in the United States has acquired a reputation as a largely thankless job. In 2018, fewer than half of American parents (46%) said they would support their child if they pursued a public school teaching career, a decrease from 70% in 2009 (Ferguson, 2018). Regardless of prestige, however, teachers still play an important role in modern society, taking responsibility for children at a critical stage in their development and training the next generation of leaders (Jimerson and Haddock, 2015). The economic value of high-quality teachers to students is staggering, with a one-standard-deviation increase in effectiveness boosting future earnings by over \$400,000 (Hanushek, 2011). Securing a steady supply of credentialed teachers, therefore, should represent one of policymakers' primary goals.

The traditional path to teacher certification involves earning a bachelor's degree in education from an accredited institution and applying for licensure from the state board. Individuals graduating with such degrees are required to have spent time in the classroom themselves, ensuring that credentialed teachers have both theoretical and practical experience prior to entering the field (*National Council on Teacher Quality, 2011*). Reciprocity agreements between states mean that those wishing to teach in a different state can obtain the proper credentials after taking additional assessments required by that state (*Teaching license reciprocity guidelines by state, 2019*). Surveys of teacher candidates report that they feel their programs left them well-prepared to begin their careers (Talbert-Johnson, 2006). When states find themselves with a shortage of traditionally-certified teachers, they are instead forced to turn increasingly to emergency-certified applicants, who have prior experience in the subject area but not necessarily in the classroom (Yanxuan, 2003).

The degree to which a state can ensure a sufficient level of credentialed teachers has

serious implications for students. In addition to the immediate impact a teacher shortage has on education quality and the long-term supply of human capital, an overabundance of emergency-certified teachers also reduces the perceived quality of education in a state. Over time, this discourages businesses and highly-educated individuals from relocating to the area, further reducing the average skill level of the labor pool (Hanushek, 2011). Furthermore, teachers themselves can have an inspirational effect on students. If students view teachers as role models, they are more likely to strive to emulate them in their own life and career decisions. This process can also unfold in reverse, as teachers who appear discouraged or overwhelmed by their experiences in the classroom can in turn push students away from the profession, exacerbating existing shortages within the state (Tomšik, 2016).

States have a number of policy options that can help alleviate labor shortages and improve conditions within teaching, including offering forgivable student loans to prospective teachers, streamlining hiring practices within schools, and improving assessment and accountability systems. Compensation (including both wages and benefits) represents the biggest factor in teachers' decision-making by far, however, influencing both entry and retention decisions (Podolsky et al., 2016). Increasing the potential income that candidates can earn reduces the gap between teaching and other fields, making graduates more likely to pursue it over other career options. The salience of the salary increase also affects the magnitude of the labor impact, as increased awareness among students of improved conditions may in turn increase their propensity to enter the field (Bacolod, 2007).

This paper utilizes data from the National Center for Education Statistics (NCES) as well as from the Department of Education's Office of Postsecondary Education (OPE) to examine the degree to which highly salient teacher raises, namely those accompanied by large-scale labor

strikes, lead an increase in the number of college students earning degrees in education (measured as a proportion of total college graduates) in subsequent years. Because of the role these programs play in facilitating entry into the teaching profession, exploring the relationship between teachers' perceived compensation and labor supply can provide policymakers with additional information about solutions to teacher shortages. If teacher salary increases represent an effective solution to labor shortages, and the degree of public awareness surrounding them influences their effectiveness, then lawmakers can dedicate more resources to facilitating such awareness and in doing so improve the impact of salary measures.

Background

Teacher pay increases may encourage some students to pursue a teaching career (Podolsky et al., 2016), but the degree to which high school students are aware of them depends on how closely they follow developments within the teaching profession. States typically set a minimum level for teacher pay and allow districts to operate above that level if they choose (Chingos et al., 2017). As a result, teachers in particularly large districts that contain an outsize share of the statewide student population (such as Chicago Public Schools) and those with higher union membership may operate under different pay conditions than the state as a whole. Events that increase the salience of raises, therefore, may factor into students' decision-making. Due to the variation in salaries between districts and the localized nature of many teacher strikes, labor actions in a single district may not attract widespread attention unless they affect a large number of students or last a particularly long time. Strikes involving multiple districts, by contrast, attract attention not only among students in the affected schools, but also among media outlets. Analyzing graduation trends in scenarios where a strike and a salary increase occur in tandem allows the best chance to determine the degree to which one influences the other.

Large-Scale Teacher Strikes

A handful of local-area strikes in the late 1990's and early 2000's affected enough students within the state to attract widespread media attention from outside the affected areas. In 1999, teachers in Detroit went on strike following disputes over salary increases, merit pay measures, and work hours. One year later, stalled contract negotiations led teachers in Buffalo to conduct two one-day strikes in the space of a week. The 2001-2002 school year was especially volatile, with ten strikes in Illinois, one in Seattle involving 6,900 educators, and a 62-day strike in Cleveland (Bureau of Labor Statistics, 2019; Lucey, 2012).

Strikes coordinated across multiple districts are especially rare, with only three of these large-scale labor disruptions occurring between 2001 and 2017 (Education Week, 2019). In 2001, a strike in Hawaii closed nearly all the public schools in the state for several weeks, as well as several college campuses. In 2004, 20 of Kentucky's 176 districts shut down as part of a dispute over health care costs. Three years later in West Virginia a one-day strike closed 14 districts after educators felt a 3.5% raise was not large enough (Education Week, 2019). Nearly ten years passed before the next statewide strike, but in early 2018 educators in West Virginia walked off the job, triggering similar actions in Oklahoma, Kentucky, Arizona, and Colorado. Teachers in Virginia, North Carolina, and South Carolina followed suit in 2019. These strikes were highly salient both within their states and nationally, and to a large degree succeeded in securing higher pay for themselves and support staff (Education Week, 2019). Unfortunately, their recency and the lack of available data makes assessing their long-term impact difficult.

Trends in Teacher Education Program Completion

While the number of bachelor's degrees conferred in the United States has risen consistently over the years, the share of teacher education program graduates within the overall group has been steadily trending downwards since the late 2000's. From a peak of 18% in 2005, the share of completers dropped to 15% the following year. While it increased slightly by 2008 (the year after the West Virginia raises), it then declined to just 8% by 2018. These trends have also been reflected consistently at the state level, with only five states seeing an increase in completers and 28 seeing a decrease larger than the nationwide drop (Partelow, 2019).

Not only has the share of teachers within each college graduating class decreased, it has also failed to keep up with trends in student enrollment. Between 2005 and 2015, the number of students enrolled across the nation increased 1.5%, with almost all of the growth in the South

(7.1%) and West (2.1%) offset by declining populations in the Northeast (-5.7%) and Midwest (-3.1%) (NCES, 2013). Over that same period, the number of students graduating from teacher education program fell by nearly 20% from 220,000 to 180,000 (Partelow, 2019). Dwindling supply of teachers, both as a share of degree-earners and relative to demand in schools, outlines a persistent and troubling picture for education in the United States unless current trends can be reversed.

Literature Review

While the effect of earnings on teachers' career decisions has received extensive attention within scholarly literature, much of the research has focused on retention of existing educators within the profession, with new teachers' decision-making considered largely as an ancillary if at all. The current body of evidence suggests that while expected compensation does play at least a minor role in these decisions, relative earnings compared to other fields represent a larger factor. When employment trends in teaching and the private sector diverge, as they did following the Great Recession, prospective teachers have a much more difficult time pursuing a career in education.

Effect of Salary-Related Factors on Career Decisions

In isolation, teacher salary does not appear to represent a major determinant in either current or incoming teachers' professional decisions. Using data from surveys of recent college graduates from the mid-1970's through the 1990's, Ballou and Podgursky (1997) found no significant connection between higher salaries and the share of education majors within a state, even accounting for returning educators and the reduced attrition brought on by the raises. Similarly, Johnson and Birkeland's (2003) survey of first- and second-year teachers in Massachusetts found that compensation was only one of several contributing factors alongside school-specific conditions and public perceptions of the profession. Since according to Ballou and Podgursky (1997) 80% of new teachers remain in or return to their home states after graduation, trends within those states should have the largest effect on local teacher labor supply.

Expected earnings do play an important role in teachers' decisions, however, when considered alongside other career fields. Johnson and Birkeland (2003) identify relative potential earnings as a major determining factor for both entrance and retention, outweighing

compensation itself, class sizes, and prestige. Furthermore, using data from the United Kingdom's University Grants Commission, Zabalza (1979) found a statistically significant correlation (at the 5% level) between the proportion of university graduates entering the teaching field and relative earnings. Studies of teachers in Michigan (Murnane and Olsen, 1989) and North Carolina (Murnane and Olsen, 1990), found teachers in different fields and at different experience levels react differently to changes in the labor market. Teachers with higher National Teacher Examination (NTE) scores and those in subjects with higher competitive salaries such as physics, chemistry, and other STEM disciplines tended to leave the profession earlier than those in less lucrative fields. Finally, Chevalier et al.'s (2007) analysis of recent graduates in the UK found that increasing teacher pay by 10% relative to alternative career options correlated with a 5.4% increase in the expected probability of a graduate choosing to teach.

This study contributes to the existing literature on the role of salaries in teachers' career decisions by connecting teacher employment trends to the salient effect of labor disruptions on pay increases, which has not been extensively explored. Additionally, because students' main experience with the teaching profession prior to enrolling in college is through their own teachers, the conditions they observe in the classroom prior to entering college can have a profound impact on their career decisions. The present study considers the degree to which students' awareness of improving conditions in the education field (influenced by the public attention a strike receives) might encourage them to seek to enter that field themselves.

Because strikes are often indicators of unsatisfactory conditions within teaching, they likely will not do much to win over those who have already ruled out a teaching career. Even if the specific conditions themselves are not readily apparent to students (such as in the case of Kentucky, where the strike concerned health insurance benefits), the strike still communicates

the message that those within the profession believe the associated compensation is insufficient. However, a successful strike that improves conditions within teaching may give those still on the fence the necessary encouragement to pursue it as a career.

Impact of the Great Recession

The economic upheaval brought on by the Great Recession had a significant impact on the teaching field. Overall teacher employment in the United States has historically been rather stable, decreasing on only two occasions between 1970 and 2009 (Partelow and Baumgardner, 2016), and at the outset it appeared that educators would be spared the worst effects of the crisis. In the first two years after the downturn, increased federal aid helped keep many schools and districts afloat, and employment among teachers remained level or increased slightly in contrast to private-sector trends (Evans, Schwab, and Wagner 2017). Following this honeymoon period, however, the teacher unemployment rate rose 5.6%, and even as private-sector employment began to recover the teaching profession remained understaffed (Partelow and Baumgardner, 2016; Evans, Schwab, and Wagner, 2017). Patterns of job losses followed preexisting trends within the field, with the layoffs concentrated among younger and less-experienced teachers, as well as those outside high-demand fields such as math, science, and special education (Goldhaber and Theobald, 2010).

Decreasing employment among teachers coincided with a rise in K-12 enrollment across the United States, forcing the remaining teachers to confront ever-larger class sizes as the recession continued (Evans, Schwab, and Wagner, 2017). The worsening work environment in many schools is both a symptom and a cause of decreasing teacher employment (Johnson and Birkeland, 2003). Prospective teachers, having already been discouraged from entering the field by the economic downturn and persistent unemployment, were further dissuaded from doing so

by worsening conditions within schools. Partelow and Baumgardner (2016) successfully quantified this trend utilizing state-level data from the U.S. Department of Education, finding that a 10% decrease in overall teacher employment was associated with a 45% decrease in teacher education program enrollment five years later.

Lagging and Leading Indicators

Due to the time gap between enrolling in a teacher education program and actually entering the profession, some degree of lag is to be expected. In addition to the delayed impact of economic trends on teacher employment identified by Evans, Schwab, and Wagner (2017), Partelow and Baumgardner (2016) identified lag in several factors related to teacher education programs, including potential earnings, relative wages, and employment conditions. Because not all students graduate in exactly four years, changes in relative opportunities have varying impacts on both current and potential enrollees. Prospective teachers must decide to pursue teaching before declaring their undergraduate major, then confirm that decision upon graduation. Because degree completion can take up to six years or longer, the wage and employment structures at the first decision point may differ radically from those at the second, as may an individual's valuation of compensation. On aggregate, teacher education program enrollment (which can occur upon college entry or at any point following) lagged behind employment trends by up to two years, a gap that somewhat mirrors the delay observed in overall teacher employment when the Great Recession began.

Conceptual Model

I hypothesize that teacher pay increases (beyond simple cost-of-living adjustments) lent additional public attention by large-scale labor strikes will make the profession more attractive to high school and college students within the state. In subsequent years, I further predict that this increased interest will translate into growth in the number of students graduating from teacher education programs. Pay and benefits within teaching are not the only factor potential educators consider when making career decisions, as relative earnings in other fields also plays a central role. This consideration affects lucrative subjects such as physics and chemistry even more heavily (Murnane and Olsen, 1989; Murnane and Olsen, 1990). Furthermore, school-level factors, including class sizes, school-level resources, and the availability of teaching jobs, affect both prospective and current teachers' decision-making. My model accounts for both classroom factors and larger economic trends, as outlined in Figure 1 below:

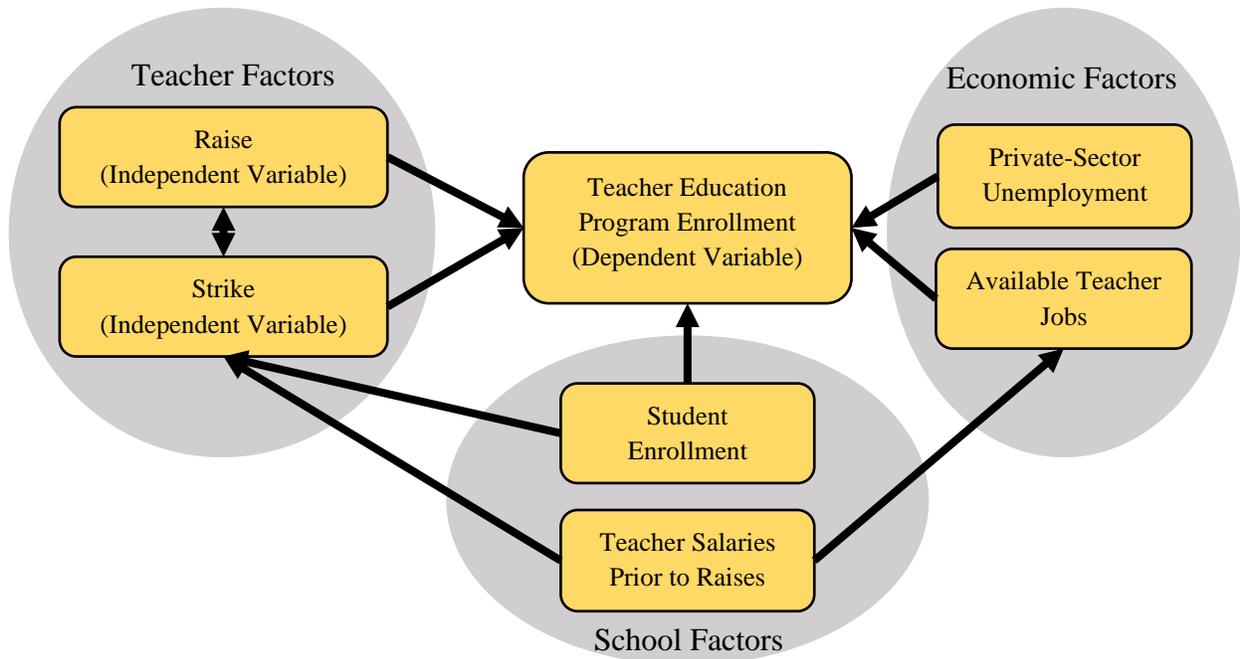


Figure 1: Factors affecting teacher education program enrollment

Teacher Labor Factors

Teacher strikes typically arise when educators seek higher pay, benefits, or additional classroom resources (Education Week, 2004). If successful, strikes bring attention to the improved situation for teachers that might otherwise have gone unnoticed. Failure, however, does little but highlight the poor conditions that led to the strike in the first place and may have a chilling effect on teacher labor supply. Raises and strikes must occur in tandem therefore, as alone the former would likely have only a marginal impact and the latter a negative one. Strikes motivated by non-salary concerns such as health benefits or school-level factors, while not explicitly tied to pay, also illustrate this trend as they lend increased salience to improving conditions in teaching that reduce the relative opportunity cost of entering the profession.

Economic Factors

Prospective teachers choose from a range of career options even after earning their degrees, and the state of alternatives plays a major role in shaping their decision (Zabalza, 1979; Johnson and Birkeland, 2003). Tight labor markets may discourage students from immediately pursuing private-sector employment, and instead fall back on teaching as a “safe” option (Murnane, Singer, and Willett, 1989). At the same time, if teacher jobs decline and force even more experienced educators out of the profession, younger individuals will be extremely reluctant to commit themselves to a teacher education program (Partelow and Baumgardner, 2016).

The education labor market is not immune to business cycles. During the early stages of the Great Recession, teacher employment stayed largely stable only to undergo a significant and persistent downturn later (Partelow and Baumgardner, 2016). If slow economic conditions persist, students who initially opted to pursue teaching may seek alternative careers in fields that

have begun to recover, especially those who can demand significantly higher salaries (Murnane and Olsen, 1989). Lagging teacher employment trends relative to the private sector (up to two years) can create a flow into teaching (and teacher education programs) in the early stages of a downturn, and in the opposite direction in later years.

School Factors

Conditions in the classroom represent one of the central factors of consideration for both new and current teachers. Students making their first college major choices have their high school experiences fresh in their mind, and if those memories are of crowded classrooms and underpaid, overworked teachers they will be less likely to view such a career favorably (Johnson and Birkeland, 2003). While within-state variation is difficult to measure, these school-level factors are still useful as a measure of central tendency. Teacher labor markets often do not function on a state level, but due to the lack of available district-level data and the difficulty associated with mapping colleges to school districts I use state-level data for my analysis. Salaries prior to the raises also affect the availability of teacher jobs within the state, as the more lucrative the field is relative to private-sector alternatives the more likely adult professionals will be to take those jobs themselves, tightening the teaching labor market and encouraging young graduates to consider alternative career paths (Murnane and Olsen, 1989, Johnson and Birkeland, 2003).

Data and Methods

My empirical analysis uses state-level data from all 50 states and the District of Columbia across a five-year period between 2003 and 2007. I obtained information on teacher education programs from the Department of Education's Annual Title II Reports, which includes data on the number of undergraduate students who graduated from teacher education programs within each state. Laws regarding teacher strikes are complicated, as in many states teachers are legally prohibited from striking. This provision makes measuring teacher strikes somewhat difficult, as state education associations must sometimes employ creative measures to avoid running violating their contracts. By coordinating with administrators to close schools and judiciously using snow days, teachers can carry out a *de facto* strike without doing so from a legal standpoint. Information on teacher strikes comes from the Bureau of Labor Statistics' Work Stoppages Program, which tracked large-scale labor disruptions across the United States for all economic sectors between 1993 and 2019, as well as from a review of post-2000 statewide education strikes conducted by Education Week.

In order to analyze the impact of potential confounding variables within states and schools, I use data from the NCES Schools and Staffing Survey (SASS), the National Education Association's (NEA) Annual Rankings and Estimates Report, and the American Federation of Teachers' (AFT) Survey and Analysis of Teacher Salary Trends. The SASS includes minimum teacher salary information for 2003 and 2007, while the AFT provides the same information for 2004 through 2006, and the NEA's rankings provide state-by-state totals for both student enrollment and teacher employment. The Bureau of Labor Statistics also tracks private-sector unemployment within each state on a monthly basis. I use the measure from May of each year since this captures the time in which students have just graduated high school and begun to look

towards college major decisions.

To analyze the relationship between teacher raises, labor disruptions, and education program enrollment, I utilize a fixed-effects regression model that includes an indicator for a large-scale strike (measured across the following three-to-six years due to the time gap between enrollment in a program and graduation), as well as an indicator variable measuring whether teachers received a 5% or higher raise within the last four years. A four-year lag was selected to capture the average value for time to degree completion after enrolling in a teacher education program (either immediately following high school graduation or after college admission).

In addition to the main dependent and independent variables, I also control for the share of the school-aged state population, teacher employment levels, and the private sector unemployment rate, as well as the annual base salary for new teachers (all measured four years prior to the dependent variable outcome). The following model analyzes the impact of raises and labor disruptions at the state-year level:

$$\begin{aligned} \log(\text{completers_share})_{it} = & \beta_0 + (\beta_1 * \text{strike_3_6}_{it}) + (\beta_2 * \text{raise}_{it}) + (\beta_3 * \\ & \text{base_salary_07}_{it}) + (\beta_4 * \text{school_aged_share}_{it}) + (\beta_5 * \text{teachers_per_10k}_{it}) + \\ & (\beta_6 * \text{private_unemployment}_{it}) + i_i + t_t + \mu_{it} \end{aligned}$$

Where i represents the state index, t represents the year index, and μ represents the error term. My dependent variable is the log of the number of students graduating from teacher education program as a share of total graduates within a state, which allows me to compare changes across both states and years. Due to the time it takes for prospective teachers to complete their programs, I measure the number of completers for between three and six years following the strike. Approximately 75% of college graduates earn their degree within six years (NCES, 2019), and the minimum of three years captures more students who made course

decisions after the raises (Seril, 2020). Enrolling in a teacher preparation program is not a one-time decision, as prospective teachers must decide to remain in the program in successive years after declaring their major. Therefore, I also measure economic and school-level conditions across the same period. The sample size for this model is 255 (50 states and the District of Columbia * 5 years). Table 1 below lays out the definitions for all the variables included in the model:

Table 1: Variable Definitions

Dependent Variable	
<i>log(completers_share)</i>	The log of the number of teacher education program completers as a share of total college graduates within a state. This information came from the Department of Education's Annual Title II Reports (2003-2007).
Independent Variables	
<i>strike_3_6</i>	Whether a large-scale teacher strike occurred in the state within the last three-to-six years. These data came from the BLS Work Stoppages Program (1999-2007) and Education Week (2000-2018).
<i>raise</i>	Whether teachers within the state received a 5% or larger raise within the last four years. These data came from the NCES School and Staffing Survey (2003 & 2007) and the AFT's Survey and Analysis of Teacher Salary Trends (2004-2006).
Economic Variables	
<i>private_unemployment</i>	The private-sector unemployment rate within the state, measured in May four years prior. These data came from the BLS Local Area Unemployment Statistics (2003-2007).
<i>log_teachers_per_10k</i>	The log of the number of teachers per 10,000 residents within the state four years prior. These data came from the NEA's Rankings and Estimates Reports (2003-2007).
School Variables	
<i>log_school_aged_share</i>	The log of the school-aged population (5-17

	years old) as a share of the overall state population four years prior. These data came from the NCES Digest of Education Statistics (2003-2007).
<i>base_salary_07</i>	The annual base salary for a teacher with a bachelor's degree and zero years' experience within the state (measured in 2007 dollars) four years prior. These data came from the NCES School and Staffing Survey (2003 & 2007) and the AFT's Survey and Analysis of Teacher Salary Trends (2004-2006).

Descriptive Statistics

Table 2 below provides some basic descriptive statistics for the key dependent and independent variables, as well as for the economic and school-level control factors. Over the five years considered in this study, the weighted annual share of teacher education program completers among total graduates in a state was 13%. This value, however, varied widely between states from a low of 0% (Idaho in 2003 and Montana in 2005) to a high of 44.75% (Alabama in 2006). Montana and Idaho's results in other years ranged from 12.2% to 15.87% and 11.05% to 18.17%, respectively, and Alabama's result was approximately double the result in both the prior and subsequent year. To account for these outliers, I eliminated any value where the share of completers deviated by more than one standard deviation from the mean value for the state. Statewide teachers strikes are relatively rare, but including large-scale local strikes and the after-effects of the numerous strikes between 1999 and 2001 captures a larger range of impacts.

Average unemployment within states largely aligned with national trends, dropping slowly throughout the early 2000's before spiking dramatically at the end of the decade as the Great Recession swept across the country. Beginning teacher salaries saw a muted but similar trend as they rose annually at a steady pace until the 2006-2007 school year, where they stagnated or even fell in many states. There was little uniformity across regions with regards to per capita teacher population, with states in the East, West, and South appearing at both the upper (Vermont, Wyoming, and Texas) and lower (Delaware, Oregon, and Arizona) ends of the spectrum. This trend did not hold for student enrollment, however, with western states including Alaska, Utah, and Texas consistently ranking at the top while eastern states such as Delaware, Pennsylvania, and New York found themselves on the low end.

The correlation coefficient between the share of teacher education program completers and the indicator for a statewide strike within the last three to six years is 0.0247 (n = 255). On the surface, this appears to signal that teacher strikes have only a weak relationship to subsequent career decisions. However, the presence of a number of potential mitigating factors, including classroom conditions, prior salary levels, and broader economic trends, may be influencing this correlation. As a result, further study is necessary to determine what (if any) impact labor disruptions have on a state’s supply of teachers over time.

Table 2: Descriptive Statistics for Dependent, Independent, and Control Variables

Variable	Mean	Min	Max	SD
Logged share of teacher education program completers among total graduates within a state	2.32	1.03	3.16	0.32
<i>Overall share of teacher education program completers among total graduates</i>	10.64	2.79	23.66	3.14
Whether a statewide teacher’s strike occurred within the last three-to-six years	0.09	0	1	0.29
Whether teachers received a 5% or higher raise within the last four years	0.30	0	1	0.46
Economic Factors				
Statewide minimum teacher salary four years earlier (In thousands, 2007 dollars)	33.99	24.45	45.79	4.39
Percent unemployed within the state four years earlier (Measured in May)	4.75	2.5	7.6	1.10
School-Level Factors				
Number of teachers employed per 10,000 people within the state four years earlier	110.98	5.34	849.35	50.50
Share of state population eligible for K-12 education four years earlier	17.70	13.19	21.82	1.28

N = 255

Results

My regression results are summarized in Table 3 below. In order to effectively analyze the impact of salary increases on teacher labor supply alongside that of labor disruptions, I included an indicator variable that triggers when the year-to-year increase in base salary (the average minimum teacher salary for a given state and year for a teacher with a bachelor's degree and zero years of experience) is greater than 5%. I observe such large increases at least once for 48 out of 51 states in the sample (Indiana, Maine, and Utah the only exceptions). Of these states, half of them increased teacher salaries more than once between 2003 and 2007. The 5% threshold was chosen because the annual inflation rate in the United States was no higher than 4% during the years considered for this study (from a minimum of 1.88% in 2003 to a maximum of 4.08% in 2007, with a mean value of 3.04%). Including only raises that exceed the inflation rate by a substantial amount allows me to be reasonably confident that I have captured meaningful salary increases rather than simple cost-of-living adjustments. Robustness checks were performed by raising and lowering the threshold by one percentage point, reducing the risk of an arbitrary threshold biasing the results in either direction.

Column 1 directly compares the effects of base salary on the share of college graduates earning education degrees four years later, without accounting for state- or year-level fixed effects. However, because graduates typically remain in their home states, changes in these variables in one state may not have substantial effects even in neighboring states. As a result, column 2 includes fixed effects for all 50 states and the District of Columbia to account for individual circumstances surrounding teacher labor supply, unemployment, and classroom conditions. This specification also incorporates time fixed effects to capture larger inter-state trends over time, which helps isolate the impact of national developments such as the Great

Recession.

Columns 3 and 4 similarly examine the impact of a single independent variable of interest on teacher labor supply. Model 3 examines the impact of a 5% or higher increase in teacher base salary (with corresponding increases in salary for teachers at higher experience and education levels) four years earlier alongside the controls and fixed effects from the previous specification. Model 4 considers the long-term effects of a teacher strike within a state. The final two specifications consider multiple independent variables simultaneously to assess the relative impacts of each on labor market outcomes. Column 5 includes both raises and strikes, and column 6 considers base salary alongside the strike variable.

Table 3: Regression Results

	(1) Base Salary	(2) Base Salary and Fixed Effects	(3) Raise and Fixed Effects	(4) Strike and Fixed Effects	(5) Strike, Raise, and Fixed Effects	(6) Strike, Base Salary, and Fixed Effects
Base teacher salary in the state 4 years earlier (2007 dollars)	-0.00590 (0.00410)	0.0120*** (0.00346)				0.01131*** (0.00349)
5% or higher increase in base salary within the last 4 years			0.0199 (0.0159)		0.0205 (0.0158)	
Large-scale strike within the last 3-6 years				0.0559* (0.0316)	0.0568* (0.0316)	0.04174 (0.03119)
Unemployment rate in the state 4 years earlier	-0.0185 (0.0165)	-0.0224* (0.0118)	-0.0260** (0.0121)	-0.0240** (0.0120)	-0.0247** (0.0120)	-0.02152* (0.01176)
Teachers per 10,000 residents in the state 4 years earlier	0.00003 (0.0002)	-0.00002 (0.0001)	0.000002 (0.0001)	0.000003 (0.0001)	0.000004 (0.0001)	-0.000019 (0.0001)
Share of state population eligible for K-12 education 4 years earlier	0.112*** (0.0140)	0.0772*** (0.0225)	0.0824*** (0.0230)	0.0842*** (0.0229)	0.0840*** (0.0229)	0.07869*** (0.0225)
State Fixed Effects		X	X	X	X	X
Constant	0.616** (0.287)	0.562 (0.423)	0.883** (0.424)	0.845** (0.423)	0.851** (0.422)	0.556 (0.423)
Observations	255	255	255	255	255	255
R-squared	0.213	0.958	0.955	0.956	0.956	0.958

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Specification Results

I hypothesized that large-scale teacher strikes within a state would lead to an increase in the share of college graduates earning education degrees three-to-six years later. The results in Table 3 provide mixed support for this hypothesis, as well as some intriguing results for other variables. In specifications 4 and 5, the coefficient for teacher strikes was significant at the 90% level, suggesting that labor disruptions do have a statistically meaningful effect on the share of college graduates earning education degrees. The results of the regression indicate that a large-scale teacher strike within the last three-to-six years is associated with an increase of about 5.6 percentage points in the share of college graduates earning an education degree.

Despite the statistically significant impact of strikes on teacher labor supply, the coefficient for raises (defined here as an increase in average base salary of 5% or more compared to the previous year's salary, measured in 2007 dollars) was not significant either in isolation or when considered alongside strikes. The robustness checks did not meaningfully alter the magnitude or the significance. Taken together, these results suggest that salary raises do not meaningfully affect potential teachers' career decisions, at least at the 5% threshold. While this result is somewhat surprising given the importance of salary in those decisions revealed in the literature, it also highlights the potential importance of salience in salary increases. Salary increases may have a significant impact on the decision-making of those who are aware of them, but if raises fail to attract public attention their effectiveness will be greatly reduced.

While the change in base salary does not appear to play a role in determining labor supply, average base salary itself does appear to have a meaningful effect. When state and year fixed effects were included in the model, a \$1,000 increase in salary for a beginning teacher with a bachelor's degree is associated with a 1.2-percentage-point increase in the share of college

graduates earning education degrees four years later. With an overall mean base salary of \$34,000, a \$1,000 increase would represent a 2.9% raise (in 2007 dollars). The magnitude of the impact decreased slightly when considered alongside large-scale strikes, but remained significant at the 99% level. This result indicates that while raises may not play a substantial role, states with higher salaries may have more success in recruiting teachers.

The coefficient for unemployment was only marginally significant in specifications that include base salary, but became statistically significant at the 95% level once strikes and raises were considered. The results of this regression indicate that a one percentage point increase in a state's unemployment rate is associated with a 2 to 3 percentage point increase in the share of college graduates completing teacher education programs four years later. The magnitude and direction of the effects of unemployment are in largely line with prior research into students' employment decisions, which generally suggest that a lack of viable private-sector alternatives prompts more individuals to enter the teaching field.

The coefficient for the share of the state population eligible for K-12 enrollment was statistically significant across all specifications. A one percentage point increase in the school-aged share of the population, likely indicating larger class sizes and a greater strain on school resources, is associated with a nearly eight percentage point increase in the share of education graduates four years later. A positive value for this coefficient is surprising given the hypothesized impact of larger K-12 student populations in driving graduates away from the profession. However, the possibility exists that individual districts and states may respond to increased demand on the education system by incentivizing entry into the teaching profession, thus leading the two variables to increase in tandem.

Discussion

Teacher salary increases, in addition to representing a vitally important issue for teachers themselves, have also been used as a policy tool to alleviate labor shortages and improve education quality within states (Kini, 2017). The degree to which raises accomplish this goal depends on a number of factors, including the salience of the raises themselves and the degree to which earnings affect prospective teachers' career decisions. Elements that influence the salience of raises, therefore, play a significant role in determining the outcome of measures aimed at increasing teacher labor supply. My research extends the current body of research into teacher labor supply by identifying and exploring the role of strikes in increasing the number of subsequent teacher education program graduates, which could in turn be a function of how strikes boost the salience of pay increases for teachers.

The results of my regressions indicate that teacher salaries themselves correlate with recent graduates' decision to enter teaching. Previous research into the importance of salary (Ballou and Podgursky, 1997; Johnson and Birkeland, 2003) found mixed results for the overall importance of salary but did cite it as one of several factors affecting teachers' decision-making. Far more important in the literature were relative salary and career opportunities (Johnson and Birkeland, 2003; Zabalza, 1979; Murnane and Olsen, 1989; Murnane and Olsen, 1990; Chevalier et al. 2007), a finding that was also reflected in the outcomes identified here. The statewide private-sector unemployment rate four years prior to graduation (when prospective teachers are formulating their career plans) correlated strongly with the proportion of college graduates earning education degrees, indicating that a lack of viable career alternatives does play a role in pushing young adults to pursue teaching.

In addition to impacts explored previously in the literature, my regression also identified

an important correlation between large-scale teacher strikes and labor supply that has not previously received widespread attention from researchers. While the model did not identify a significant relationship between meaningful raises (larger than 5%) and the share of college graduates earning education degrees, the proportion of degree earners was significantly associated with a large-scale strike within the last three-to-six years. This finding raises important implications for the potential impact of salary increases, as it suggests that conditions leading to a strike (low political power for teachers, unacceptably poor working conditions, or persistent state budget shortfalls leading to a lack of funding), may have played a role in depressing pre-strike teacher labor supply. At that point, a successful strike would necessarily lead to a larger subsequent increase in graduates earning education degrees. A second potential explanation is that a strike plays a role in boosting the salience of subsequent policy measures intended to address it, measures that might not have received extensive public attention had they been passed under more typical circumstances. Events that highlight improved conditions within teaching (such as a successful strike) may in turn make it more likely that high school and college students will respond by pursuing it as a career.

The policy implications of this finding for teacher labor supply may initially appear discouraging in light of the findings surrounding raises. However, the significant role strikes appear to play suggests the salience of compensation may be an important factor and provides policymakers with an option to broaden the impact of salary-based responses to labor shortages. In short, if people are unaware that a policy change has taken place then they will not change their behavior in response, but when highly salient events call attention to the change the impact will necessarily be larger. Of course, state legislators cannot control teacher strikes—if they could, 2018 would have unfolded quite differently in Oklahoma, West Virginia, and Kentucky—

but they can to some degree control the level of attention measures that improve working conditions for teachers receive. Drawing public attention to legislative action on teacher pay through advertising in schools, social media, and direct messaging to constituents will raise the salience of these actions, and in the process improve the labor market impacts of teacher raises. For states and districts facing persistent teacher shortages, any tool that could help them close the employment gap represents an important potential lifeline.

Although my analysis controls for broader economic trends and observable conditions in the average classroom, data availability and the broad nature of state-level data still create potential biases. Lack of specific data on outcomes within individual districts or local areas made it difficult to isolate the impact of a large-scale strike on the K-12 students directly affected by it. Comparing strikes in one of these localities to education degree completion rates at local colleges in subsequent years could allow for a more precise estimate of the strike's long-term impact. Events in the intervening years between the end of my dataset and the present day represent another limitation. Major economic developments (the Great Recession and the pandemic-related downturn), the wave of teacher labor actions in 2018, and political realignment in the wake of the 2016 and 2020 elections may have altered the magnitude and direction of some of the observed effects. Finally, the data on education degree earners was not delineated by race/ethnicity, gender, or income status. Obtaining specific data that measures outcomes for each of these subgroups could yield additional insights.

Further research intended to address these limitations would provide more clarity as to the specific impacts of teacher strikes on labor market outcomes. By measuring a large-scale strike's impact on the students who are directly affected (by having their schools closed), rather than those who were simply more likely to hear about it (those outside the affected district or

districts who would interact with media coverage of the strike without having their own school schedule disrupted), individual district or local area comparisons would draw a direct line between the two and allow for a more precise estimate. The wave of teacher strikes in 2018 offers future researchers a rich trove of data in the coming years, and connecting these largely successful strikes to subsequent college completion rates for education students could both shed additional light on the role of strikes in boosting saliency and identify whether those impacts have shifted in the intervening years.

Finally, a more detailed analysis of strikes' impact on specific subgroups could result in a more refined picture of the factors affecting teachers' labor market outcomes. Examining demographic data on college completers would reveal whether specific populations (such as women, racial minorities, or low-income students) see larger or smaller impacts from strikes when making career decisions. Additionally, breaking completion rates down by programs of study among students earning multiple degrees (for example, comparing students from mathematics backgrounds to those more focused on the humanities) could further illuminate the relationship between relative career options and the decision to enter teaching. Individuals with opportunities in more lucrative fields may respond differently to strikes due to different relative salary structures, meaning that policymakers would likely have to enact more substantial reforms with higher saliency to attract them.

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